



DERWENT-ACC-NO: 1985-304561

DERWENT-WEEK: 198549

APPEAL EDITION LTD

Times New Roman 12

TITLE: Prepn. of porous carbon plates - with good chemical resistance and electric conductivity

INVENTOR: AWATA, Y; IWAKI, O

PRIORITY-DATA: 1984EP-0303691 (June 1, 1984), 1984US-0623260 (June 21,

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN
EP 162976 A	December 4, 1985	E	016	N/A
CA 1223704 A	July 7, 1987	N/A	000	N/A
DE 3471122 G	June 16, 1988	N/A	000	N/A
EP 162976 B	May 11, 1988	E	000	N/A
US 4619796 A	October 28, 1986	N/A	000	N/A

INT-CL (IPC): C04B035/52, D01F009/14, D21H005/00, H01M004/96

ABSTRACTED-PUB-NO: EP 162976A

## BASIC-ABSTRACT:

A process for prepn. of porous C plates is claimed comprising: (a) forming a sheet from a mixt. of 65-90 (pref. 75-90) pts. wt. C fibre-forming organic fibre and 10-35 (pref. 10-25) pts. wt. pulp according to a paper making method; (b) impregnating this sheet with a soln. of an organic polymer, pref. in an amt. of 20-200 wt.% polymer, based on wt. of sheet; (c) oxidising this impregnated sheet, pref. at a temp. of 150-350 deg. carbonising and (d) C in air this infusibilised sheet a temp. of at least 800 deg. C in an inert gas

## United States Patent [19]

Awata et al.

(11) Patent Number: 4,619,796

(45) Date of Patent: Oct. 28, 1986

[54] PROCESS FOR PREPARATION OF POROUS CARBON PLATES

4,115,328 9/1978 Christner et al. 264/23.3

[15] Inventors: Yoshihiko Awata, Tokyo; Osamu Iwaki, Ichikawa, both of Japan

4,228,816 10/1980 Yamamoto et al. 264/23.4

[73] Assignee: Oji Paper Company, Ltd., Tokyo, Japan

4,334,450 11/1983 Schleifer 264/23.7

[21] Appl. No.: 621,400

4,454,208 2/1984 Pihura et al. 264/23.3

[22] Filed: Jan. 21, 1984

[51] Int. Cl. 1 D01P 9/14

[52] U.S. Cl. 264/29.4; 162/142;

264/29.6; 264/29.7; 421/447.6; 421/447.7;

[53] Field of Search 264/29.4, 29.2, 29.6;

421/447.9

[56] References Cited

[57] U.S. PATENT DOCUMENTS

3,174,851 3/1965 Ohara et al. 264/29.7

3,239,356 11/1975 Schleifer 421/447.9

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[58] FOREIGN PATENT DOCUMENTS

1947363 1/1971 Fed. Rep. of Germany 264/23.4

50-02218 10/1975 United Kingdom 264/23.3

1979/00 7/1970 United Kingdom 264/23.3

Primary Examiner—Jeffrey Thurrow  
Attorney, Agent, or Firm—Armstrong, Nikaido, Muradstein & Kubovall

[59] ABSTRACT

Porous carbon plates are made by forming a sheet from a mixture comprising 65-90 weight parts of a carbon fiber-forming organic fiber and 10-35 weight parts of a pulp according to a paper-making method; impregnating the sheet with a solution of an organic polymeric substance to prepare an impregnated sheet; subjecting the impregnated sheet to an oxidizing treatment; and then carbonizing the infusibilized sheet at a temperature of at least 800°C. in an inert gas atmosphere.

13 Claims, No Drawings

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INVENTOR: AWATA, Y; IWAKI, O

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<u>EP 162976 B</u>	May 11, 1988	E	000	N/A
US 4619796 A	October 28, 1986	N/A	000	N/A

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ABSTRACTED-PUB-NO: EP 162976A

BASIC-ABSTRACT:

A process for prepn. of porous C plates is claimed comprising: (a) forming a sheet from a mixt. of 65-90 (pref. 75-90) pts. wt. C fibre-forming organic fibre and 10-35 (pref. 10-25) pts. wt. pulp according to a paper making method; (b) impregnating this sheet with a soln. of an organic polymer, pref. in an amt. of 20-200 wt.% polymer, based on wt. of sheet; (c) oxidising this impregnated sheet, pref. at a temp. of 150-350 deg. carbonising and (d) C in air this infusibilised sheet a a temp. of at least 800 deg. C in an inert gas atmos. Opt. the sheet can also incorporate a strengthening agent. Opt. the impregnated sheet, or opt. a number of sheets laminated together, are heat-pressed to effect moulding and curing and then oxidised. This heat pressing is pref. carried out at a temp. of 150-220 deg. C for 1-60 min.

**ADVANTAGE** - The plates have excellent chemical resistance, electric conductivity and strength.

ABSTRACTED-PUB-NO: EP 162976B

**EQUIVALENT-ABSTRACTS:**

A process for prepn. of porous C plates is claimed comprising: (a) forming a sheet from a mixt. of 65-90 (pref. 75-90) pts. wt. C fibre-forming organic fibre and 10-35 (pref. 10-25) pts. wt. pulp according to a paper making method; (b) impregnating this sheet with a soln. of an organic polymer, pref. in an amt. of 20-200 wt.% polymer, based on wt. of sheet; (c) oxidising this impregnated sheet, pref. at a temp. of 150-350 deg. carbonising and (d) C in air this infusibilised sheet a a temp. of at least 800 deg. C in an inert gas atmos. Opt. the sheet can also incorporate a strengthening agent. Opt. the impregnated sheet, or opt. a number of sheets laminated together, are heat-pressed to effect moulding and curing and then oxidised. This heat pressing is pref. carried out at a temp. of 150-220 deg. C for 1-60 min.

**ADVANTAGE** - The plates have excellent chemical resistance, electric conductivity and strength.

US 4619796A

Porous carbon plates are made by impregnating (A) a sheet formed by a paper making method from a mixt. of 65-90 wt.% carbon fibre-forming unoxidised organic fibre and 10-35 wt.% pulp, with (B) a soln. of organic polymeric substance. The impregnated sheet is subjected to oxidising treatment then carbonised at at least 800 deg. C in an inert gas atmos..

Suitably, the oxidising treatment is effected in air at 150-350 deg. C. The carbon-fibre forming fibre is e.g. of polyacrylonitrile, rayon, pitch, lignin or phenolic resin.

**ADVANTAGE** - A thick, high quality porous carbon plate with excellent chemical resistance, electrical conductivity and strength is obtd. at moderate cost. It can be used as a fuel cell electrode material. (5pp)i

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Document Identifier - DID (1):

**EP 162976 A**

Document Identifier - DID (4):

**EP 162976 B**

PAT-NO: JP354148856A

DOCUMENT-IDENTIFIER: JP 54148856 A

TITLE: MANUFACTURE OF THERMOSETTING RESIN SHEET- OR  
PLATE-LIKE  
PREFORMED ARTICLE

PUBN-DATE: November 21, 1979

INVENTOR-INFORMATION:

NAME  
SHIRAI, AKIRA

INT-CL (IPC): B29D007/14

US-CL-CURRENT: 264/175

ABSTRACT:

PURPOSE: To obtain a thermosetting resin sheet- or plate-like preformed article without requiring build-up steps, by rolling a mixture of a setting resin with an additive, which is being carried by a conveyor, with rolls, and by cutting the semicured mixture.

CONSTITUTION: A setting resin, a filler, etc. are fed from the storage tanks 1, 2, and 3 to the kneader 4, discharged from the outlet 7, and placed on the conveyor belt 8. The composition is then shaped into a plate by the rolls 9 and 9' facing each other on either side of the belt 8, and heated with radiofrequency in the zone 11 to make the resin turn to the B-stage. The formed article 11 is continuously cut by the cutter 13 to a desired size. The cut sheet-like preformed article 16 is carried by the conveyor 14 and stored in the place 15.

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Document Identifier - DID (1):

**JP 54148856 A**

PAT-NO: JP363062713A

DOCUMENT-IDENTIFIER: **JP 63062713 A**

TITLE: METHOD AND DEVICE FOR MANUFACTURE OF FIBER  
REINFORCED  
RESIN CONTINUOUS MOLDING

PUBN-DATE: March 19, 1988

INVENTOR-INFORMATION:

NAME

KOBA, TOMOHITO  
NAKAKURA, TOSHIYUKI  
SAKAI, HIDEO  
ODAJIMA, TOSHIHIRO  
MARUKO, CHIAKI

INT-CL (IPC): B29C043/22, B29C043/48

US-CL-CURRENT: 264/45.8

ABSTRACT:

PURPOSE: To improve productivity and manufacture a molding having no limit in the length thereof in principle, by a method wherein fibers and thermoplastic resin are carried into a compression molding unit by a belt to heat and mold them by the compression of a top force and a bottom force through said belt, thereafter, is compressed and cooled.

CONSTITUTION: Fibers, such as glass fibers or the like for example, is laminated on a thermoplastic resin film, such as nylon or the like, to obtain a molding material 20. These molding materials 20, mounted on a trestle 1, are supplied between upper and lower belts 2, 3. The belts 2, 3 are driven by a motor inch by inch and the molding material 20, sent to a preheating unit C, is heated by infrared rays heater or a far infrared rays heater, for example, to a temperature higher than the glass transition point of the molding material resin 20 or higher than the softening point of the same preferably. The

preheated molding material 20 is sent into heating and compression molding molds 5, 6 of a compression molding unit D and is molded by compression effected by a hydraulic unit 9. Subsequently, the molding material is sent into compression and cooling molds 7, 8 to compress and cool it by the hydraulic unit 9.

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Document Identifier - DID (1):

JP 63062713 A

DERWENT-ACC-NO: 1988-116159

DERWENT-WEEK: 198817

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TITLE: Appts. for mfg. continuous fibre reinforced resin prod.  
- comprises pair of endless belts between which resin is  
compressed, heated and cooled

PRIORITY-DATA: 1986JP-0207618 (September 3, 1986)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>JP 63062713 A</u>	March 19, 1988	N/A	008	N/A
JP 93082283 B	November 18, 1993	N/A	009	B29C 043/22

INT-CL (IPC): B29C043/22, B29C043/48, B29K105/06, B29K105/06

ABSTRACTED-PUB-NO: JP 63062713A

BASIC-ABSTRACT:

Mfg. a fibre-reinforced resin continuous moulded prod., fibre and thermoplastic resin, is conveyed to a compression moulding part by belt. Heat compression moulding is effected on the fibre and the resin by top and bottom mould, both formed in a plane shape, through the medium of the belt. The resin is compression-cooled by the top and the bottom moulds, both formed in a plane shape. The fibre and the thermoplastic resin are conveyed in a compression moulding part in a state to be nipped by upper and lower belts. The fibre and the resin are heat-compression-moulded in a state to be nipped by the upper and the lower belt and are then compression-cooled. The composition of the fibre-reinforced resin continuous moulded prod is preheated before heating-compression-moulding.

USE/ADVANTAGE - Productivity is good since there is no need to increase the temp. of a compression moulding tool as in a conventional method and device.

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Document Identifier - DID (1):

JP 63062713 A

PAT-NO: JP357148618A

DOCUMENT-IDENTIFIER: **JP 57148618 A**

TITLE: PRODUCTION SYSTEM IN CONTINUOUS FORMING LINE

PUBN-DATE: September 14, 1982

INVENTOR-INFORMATION:

NAME

OMURA, SATORU  
SHIITANI, TETSUO  
ASHIZUKA, TORU  
FURUIDE, MASASHI

INT-CL (IPC): B29C017/03, B29C003/00, B30B013/00

ABSTRACT:

PURPOSE: To prevent stop of the entire line due to outbreak of a trouble in a continuous forming line, by cutting every part of the formed product after forming the product from the sheet like continuous object of thermoplastic resin at the predetermined interval, then operating the trimming press.

CONSTITUTION: After thermoplastic resin is extruded as continuous sheet from a T die 2, the sheet S is sent to a forming press 4 while it is at the high temperature and formed successively into the predetermined shape at the predetermined interval in the length direction. Then the sheet S is cut by an appropriate cutting device 15 of a guillotine etc. so as one of the formed product part P is contained in every cut unit Su of the sheet. Thereafter, the cut unit Su of the sheet is fed one by one to a trimming press 17 by an appropriate pushing device 16 of an air pusher etc. and trimmed. Scrap 19 is crushed by a crusher 11 and reused.

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Document Identifier - DID (1):

**JP 57148618 A**

DERWENT-ACC-NO: 1990-117791

DERWENT-WEEK: 199016

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TITLE: Porous carbon electrode substrates for fuel cells - have optimised porosity, gas permeability, resistivity and thermal conductivity

INVENTOR: ABE, H; FUKUDA, H ; FUNABASHI, M

PRIORITY-DATA: 1988JP-0258740 (October 14, 1988)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>EP 364297 A</u>	April 18, 1990	N/A	000	N/A
CA 2000664 A	April 14, 1990	N/A	000	N/A
CA 2000664 C	January 24, 1995	N/A	000	H01M 004/96
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<u>EP 364297 B1</u>	January 26, 1994	E	011	H01M 004/96
JP 02106876 A	April 18, 1990	N/A	000	N/A

INT-CL (IPC): C04B038/00, C10B053/00 , H01M004/96

ABSTRACTED-PUB-NO: EP 364297A

BASIC-ABSTRACT:

Porous C electrode substrate for a fuel cell has: (a) porosity 50-80%, at least 70% of pore vol. provided by 15-60 micron size pores; (b) specific gas permeability 40-500 ml/cm.hr.mm.aq.; (c) vol. resistivity not above 20 m ohm.cm; and (d) thermal conductivity not less than 2 k cal/m.hr.deg.C.

The substrate is mfd. by press-moulding, calcining and carburising a mixt. of C fibres, coke particles, binder and pore-forming agent.

ADVANTAGE - Substrate provides a desired combination of electrical and thermal

properties.

ABSTRACTED-PUB-NO: EP 364297B

EQUIVALENT-ABSTRACTS:

A process for producing a porous carbon electrode substrate for a fuel cell which substrate has (1) a porosity of from 50 to 80%, (2) a pore distribution rate of not less than 70% where the pore distribution rate is the proportion (%) of the pore volume attributable to pores having a diameter of from 15 to 60 microns relative to the total pore volume when the pore volume is measured by a mercury porosimeter, (3) a specific gas permeability of from 40 to 500 ml/cm.hr.mmAq, (4) a volume resistivity of not greater than 20 mohm.cm and (5) a thermal conductivity of not less than 8.37 KJ/m.hr.deg.C (2 kcal/m.hr.deg.C), said process comprising (i) mixing from 5 to 20% by weight of short carbon fibres having an average diameter of from 5 to 20 microns and a length of from 0.005 to 2.5 mm, from 15 to 30% by weight of coke particles having an average particle diameter of from 8 to 50 microns and a carbon content of not less than 97% by weight, from 20 to 40% by weight of a binder having a carbonising yield of from 40 to 70% by weight upon calcination at 900 deg.C and from 30 to 60% by weight of a preforming agent having a carbonising yield of not greater than 10% by weight upon calcination at 900 deg.C, (ii) press-moulding the resultant mixture under heating and (iii) thereafter calcining and carbonising the moulded material in an inert atmosphere and/or under a reduced pressure at a temperature of from 800 to 3000 deg.C.

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EP 364297 A

Document Identifier - DID (5):

EP 364297 B1